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10/574,955	04/07/2006	Masanori Adachi	289413US2PCT	8510
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			HAN, SHENG	
ART UNIT	PAPER NUMBER			
		1793		
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08/18/2009	ELECTRONIC			

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/574,955	<b>Applicant(s)</b> ADACHI ET AL.
	<b>Examiner</b> SHENG HAN	<b>Art Unit</b> 1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on \_\_\_\_\_.  
 2a) This action is FINAL.      2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 53-68 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_ is/are allowed.  
 6) Claim(s) 53-68 is/are rejected.  
 7) Claim(s) \_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                 | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments with respect to claims 53-68 have been considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 53, 54 are rejected under 35 U.S.C. 102(b) as being anticipated by Twardowski (4692228).

Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38).

Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent aresenic on the cathode side (col. 2, lines 30-37).

Claim 54, Twardowski describes that prior to passing through the cathode and anode, the solution is made up of hydrogen ions, chloride ions, arsenic and water (col. 4, lines 23-25).

#### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski (4692228).

Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38). Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37). This partition wall used to separate the cathode from

the anode also functions as a flow controlling mechanism because it is a barrier between the cathode terminal and other aspects of the cell, and reduces some of the shearing force that would affect the cathode end. With regard to the shearing force suppression device, Applicant explains that this can be monitored by use of a strong acid or base, Twardowski teaches use of acid in the system (abstract), but does not specifically teach that it is used to affect the shearing force.

It would have been obvious to one of ordinary skill in the art at the time of the invention that since an acidic or basic environment would reduce the shearing force, that the addition of an acid, as taught by Twardowski, would result in this reduction.

Claim 55, 56, 57 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski and further in view of Lewis III (5770090).

Twardowski teaches that HCl and arsenic are fed to a contaminant inlet (Fig. 1, 14 and col. 3, lines 49-50), but does not necessarily teach a slurry withdrawal port for draining the heavy metal collected in the heavy metal collection tank.

Lewis teaches purifying a waste water stream contaminated with heavy metals using a combination of features including a pre-processing absorption step and electroplating using a cathode terminal (abstract and col. 6, lines 57-65). The heavy metal is deposited on this terminal end (col. 4, lines 10-15) and is eluted off using a stripping solution (col. 6, lines 66-67). In one embodiment, an aqueous stream containing the heavy metal is fed into a tank for temporary storage (col. 7, lines 16-19).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a means to drain the metal collected in the storage tank, as taught by Lewis, in the process as described by Twardowski because this enables the heavy metals to be processed as the waste water is being decontaminated.

Regarding Claim 56, Lewis teaches that the heavy metal is deposited on the cathode terminal end (col. 4, lines 10-15) and is eluted off using a stripping solution (col. 6, lines 66-67). In one embodiment, an aqueous stream containing the heavy metal is fed into a tank for temporary storage (col. 7, lines 16-19). After placement in this chamber, just the waste water is pumped off via valves and recycled (col. 7, lines 58-65). This method allows for recovery of the heavy metal waste by leaving the metal behind in the storage tank.

Regarding Claim 57, Lewis teaches that the storage tank which contains both waste water and heavy metal has an agitation device in it (Fig. 2, 34).

Regarding Claim 58, Lewis teaches that within the EMR unit there is an ion selective membrane compartment around the anode in order to prevent oxidation of chromium (col. 11, lines 40-42). Although Lewis does not specifically teach that the selective membrane compartment is in either cylindrical, box or bag shaped, it would have been obvious to one of ordinary skill in the art at the time of the invention that a

membrane enclosing an electrode would be in a shape that could enclose the electrode, such as in a bag, cylinder or box shape.

Claims 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski, as applied to Claim 53, and further in view of Oesterle (5656140). Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38). Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37).

Although Twardowski teaches that the waste is directed at the cathode of the electrode terminal and that the anode is separated from the cathode and isolated from

the metallic waste by a permeable membrane, Twardowski does not describe how a radial placement of the two electrodes.

Oesterle teaches use of a chamber where a cathode sits in the middle surrounded by a permeable membrane and anodes surround the cathode in the chamber, radially from the center of the chamber (Fig. 2). Oesterle however, teaches that the placement of the cathode and anodes can be reversed so that the anode sits in the middle and the cathodes surround it (col. 8, lines 32-34). This configuration can be considered a radial pattern.

Since Twardowski describes isolating the anode from the cathode using a permeable membrane in order to prevent oxidation of the heavy metal, it would have been obvious to one of ordinary skill in the art at the time of the invention to place the electrodes in a radial configuration with the anode in the center and a plurality of cathodes surrounding it, as described by Oesterle, with the structure as described by Twardowski because it allows for the anode to be isolated from the cathode while allowing for more cathodes to be used, thereby increasing the surface area for which the heavy metals can be deposited on.

Regarding Claim 60, Oesterle teaches that a plurality of cathodes can be used in the vessel (col. 8, lines 32-34).

Claim 66 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski and Oesterle (5656140) as applied to Claims 59, 60, and further in view of Ward Close (20060130610).

Twardowski and Oesterle describe a method of removing heavy metal contaminants in an aqueous solution by using electrolysis that includes an anode and a cathode, where a plurality of cathodes can be used and an anode is used. It is taught that a permeable membrane is used to separate the electrodes and that the anode can be isolated by the cathode.

Neither of these references teach the use of more than one cathode where there is a higher reduction potential than the other cathode.

Ward-Close explains a method for purifying metal particles made from an electrochemical process (abstract). Ward-Close explains that a metal can be deposited on a cathode using a cathode electrode and employing a second cathode that is maintained at a potential that is more negative than the first cathode (para. 0006). In this case, at a certain point, the metal can be deposited onto one cathode and dissolved by the other cathode (para. 0006). On one end of the tank is an anode (Fig. 2, 3). Finally, as depicted by Ward-Close, the cathodes can be aligned such that they are in a line and one of the cathodes is closer than the other to the anode (Fig. 2). Furthermore, Ward-Close teaches that the product can be collected (Fig. 5, 15).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply different charges to the cathodes, as taught by Ward-Close, in the process as described by Twardowski and Oesterle because it is one known method of

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removing contaminants from an aqueous liquid stream in addition to the heavy metal contaminants in the solution.

Claim 61 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski as applied to claim 53 above, and further in view of Beer (4670114). Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38). Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37).

Although Twardowski teaches that the waste is directed at the cathode of the electrode terminal where the heavy metals are collected for later removal from the waste water, Twardowski does not teach use of a flow that obviates the shearing force

of the mixing path. It would have been obvious to one of ordinary skill in the art at the time of the invention however, to maintain the flow such that it would not disturb the collected film of metallic particles along the cathode side of the container so as to undo all electrolyzing effect of the container.

However, Beer teaches a method of isolating metal ions from a liquid slurry using a cathode electrode and an anode electrode (Fig. 3 and col. 5, lines 44-46) where a diaphragm or a membrane is used to divide the electrodes into two compartments (col. 5, lines 45-46). Beer further explains that a tube in which air is bubbled upwardly through the slurry in the cathode end is used (col. 5, lines 57-59). Beer discusses that there are migrating ions in the solution (col. 4, line 23). Beer further explains that the waste water including the metal ions are supplies via a burette where the rate of the supply of the solution should be constant (col. 5, lines 65-68 to col. 6, lines 1-3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a bubbling up of air or gas in the slurry, as taught by Beer, with the system, as taught by Twardowski in order to agitate the mixture so as to aid metal ions move toward the electrodes. With regard to the rate, it would have been obvious to one of ordinary skill in the art at the time of the invention to supply the waste at a constant rate so that the rate to ionize it would be predictable.

Claim 62 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski and further in view of Lewis III (5770090) and further in view of Beer (4670114).

Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38). Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37). Twardowski teaches that HCl and arsenic are fed to a contaminant inlet (Fig. 1, 14 and col. 3, lines 49-50), but does not necessarily teach a slurry withdrawal port for draining the heavy metal collected in the heavy metal collection tank.

Lewis teaches purifying a waste water stream contaminated with heavy metals using a combination of features including a pre-processing absorption step and

electroplating using a cathode terminal (abstract and col. 6, lines 57-65). The heavy metal is deposited on this terminal end (col. 4, lines 10-15) and is eluted off using a stripping solution (col. 6, lines 66-67). In one embodiment, an aqueous stream containing the heavy metal is fed into a tank for temporary storage (col. 7, lines 16-19). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide a means to drain the metal collected in the storage tank, as taught by Lewis, in the process as described by Twardowski because this enables the heavy metals to be processed as the waste water is being decontaminated.

With regard to the shearing force, although Twardowski teaches that the waste is directed at the cathode of the electrode terminal where the heavy metals are collected for later removal from the waste water, Twardowski does not teach use of a flow that obvious the shearing force of the mixing path. It would have been obvious to one of ordinary skill in the art at the time of the invention however, to maintain the flow such that it would not disturb the collected film of metallic particles along the cathode side of the container so as to undo all electrolyzing effect of the container.

However, Beer teaches a method of isolating metal ions from a liquid slurry using a cathode electrode and an anode electrode (Fig. 3 and col. 5, lines 44-46) where a diaphragm or a membrane is used to divide the electrodes into two compartments (col. 5, lines 45-46). Beer further explains that a tube in which air is bubbled upwardly through the slurry in the cathode end is used (col. 5, lines 57-59). Beer discusses that there are migrating ions in the solution (col. 4, line 23). Beer further explains that the

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waste water including the metal ions are supplied via a burette where the rate of the supply of the solution should be constant (col. 5, lines 65-68 to col. 6, lines 1-3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply a bubbling up of air or gas in the slurry, as taught by Beer, with the system, as taught by Twardowski in order to agitate the mixture so as to aid metal ions move toward the electrodes. With regard to the rate, it would have been obvious to one of ordinary skill in the art at the time of the invention to supply the waste at a constant rate so that the rate to ionize it would be predictable.

Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski (4692228) as applied to Claim 53, and further in view of Andelman (5748437).

Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound

introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38).

Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37). The type of electrode use is three dimensional (abstract). Because of its high surface area, the electrolyte contacts the surface of the electrode for a relatively longer period of time (abstract). Twardowski does not specifically teach that the cathode electrode, which collects the heavy metal ions, has a smooth surface and that there is another one that has a rough surface.

Andelman teaches a method of purifying a contaminated liquid stream using electrolysis (abstract). This device is made up of an anode and a cathode (col. 2, lines 25-26) which can be made into a wide variety of geometric shapes consistent with having a high surface area (col. 2, lines 55-58), including a spiral wound, washer, disk, stacked or flat sheet (col. 5, lines 9-11). The anode and cathode may be partially or completely enclosed (col. 2, lines 60-62). Separating these electrodes can be a permeable membrane (col. 4, lines 60-65). Andelman further teaches that there can be a plurality of anodes and cathodes employed in this clarification process (col. 5, line 7). In one alternative embodiment, Andelman teaches that the electrodes can be a long cylindrical shape with protrusions coming out from them, (Fig. 6, 7, 9 and 10) which make them rough, or that they can be in a pentagonal shape (Fig. 11, 12), making them similarly rough, or in a flat and straight cylindrical shape (Fig. 13, 14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate at least one high surface area-types of electrodes of a rough shape to purify a liquid stream, as taught by Andelman, in the purification system as taught by Twardowski because a nonlinear, rough shaped electrode results in a higher surface area and also leads to more heavy metals plated on the electrode. This ultimately results in greater contaminant removal in the liquid.

Claims 65 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski as applied to Claim 53, and further in view of Ward Close (20060130610).

Twardowski teaches a method of processing a compound contaminated with arsenic using electrolysis to remove the heavy metal (abstract). The device can have an anode and a cathode with a permeable membrane separating the two electrodes (col. 3, lines 7-14, 21-22 and col. 11, lines 40-41). The contaminated material flows through a device and is first directed to the cathode (Fig. 1, 12 and col. 6, lines 57-60) and includes water (col. 4, lines 24, reaction on anode end). If the cathode has an insufficiently large surface area to permit all the arsenic contamination to be removed in one pass, the residual solution can be moved through the outlet and recirculated through the cathode again (col. 3, lines 67-68 to col. 4, lines 1-3). The compound introduced into the cathode chamber is arsenic-contaminated acid (col. 3, lines 37-38). Twardowski explains that the anode and the cathode should be separated with a membrane because it prevents the chlorine at the anode from reacting with the arsenic

deposited on the cathode and it also prevents oxidation of trivalent arsenic on the cathode side (col. 2, lines 30-37). The type of electrode use is three dimensional (abstract). Because of its high surface area, the electrolyte contacts the surface of the electrode for a relatively longer period of time (abstract).

Ward-Close explains a method for purifying metal particles made from an electrochemical process (abstract). Ward-Close explains that a metal can be deposited on a cathode using a cathode electrode and employing a second cathode that is maintained at a potential that is more negative than the first cathode (para. 0006). In this case, at a certain point, the metal can be deposited onto one cathode and dissolved by the other cathode (para. 0006). On one end of the tank is an anode (Fig. 2, 3). Finally, as depicted by Ward-Close, the cathodes can be aligned such that they are in a line and one of the cathodes is closer than the other to the anode (Fig. 2). Furthermore, Ward-Close teaches that the product can be collected after the electrodeposition (Fig. 5, 15 and para. 0056).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply different charges to the cathodes, as taught by Ward-Close, in the process as described by Twardowski because it is one known method of removing contaminants from an aqueous liquid stream in addition to the heavy metal contaminants in the solution.

Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Twardowski as applied to Claim 53, and further in view of Ward Close (20060130610) and further in view of Gibson (3764500).

Twardowski and Ward-Close describe a method of removing heavy metal contaminants in an aqueous solution by using electrolysis that includes an anode and a cathode, where a plurality of cathodes can be used and an anode is used. It is taught that a permeable membrane is used to separate the electrodes and that the anode can be isolated by the cathode. Ward-Close also teaches that one set of cathodes can be used to dissolved the metal and the other used for electroplating the metal.

Neither of these references teach the use different compounds for the two cathodes, although it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the materials used for the different electrodes according to what they're used for, however, this feature is taught by Gibson.

Gibson describes a process for clarifying an aqueous solution using a plurality of electrodes, including cathodes and anodes. The anode comprises graphite or titanium with a coating of lead dioxide (col. 5, lines 66-69). The cathode can comprise a metal made of copper, stainless steel, iron or another suitable metal (col. 6, lines 4-7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate features that would optimize the functions of the electrodes by utilizing different materials for each electrode, as taught by Gibson, with the process as taught by Twardowski and Ward-Close in order facilitating the dissolution and deposition steps.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHENG HAN whose telephone number is (571)270-5823. The examiner can normally be reached on Monday-Thursday, 8:00-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melvin Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sheng Han  
Examiner  
Art Unit 1793

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/Melvin Curtis Mayes/  
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